Unit 9
Day 4
Variation

Direct Variation:

If y varies directly as the nth power of x or if y is directly proportional to the nth power of x, then $y=kx$. Where k is the constant of variation (proportionality).

Ex1: Write the equation

r is directly proportional to a with a constant of variation of 16.

varies directly

$r = 16a$

$Y = KX$

Ex2: Write the equation
a varies directly with b with a constant of variation of $\frac{3}{5}$.

$$a = \frac{3}{5}b$$

Inverse Variation:

If y varies inversely as the nth power of x, or If y is inversely proportional to the nth power of x, then $y=\frac{k}{x}$.

Ex1: Write the equation

If b varies inversely as r with a constant variation of 2.6.

$$b = \frac{2.6}{r}$$

$$Y = \frac{K}{X}$$

Ex2: Write the equation: y varies inversely as x^3.

$$y = \frac{k}{x^3} \qquad k = 1$$

$$y = \frac{1}{x^3}$$

Joint Variation:

If y varies jointly with the nth power of x and z, then $y=kx^nz$.

Ex1: Write the equation
w varies jointly with c and f^2 with a constant of proportionality π.

$$w = \pi c f^2$$

Ex2: Write the equation

D varies jointly with r and t with a constant of variation of 1.

$$D = rt$$

Ex3: Write the equation
r is proportional to x^2 and inversely proportional to y.

$$r = \frac{kx^2}{y}$$

Write each formula as an English phrase.

Ex1:

$C=2\pi r$, where c is the circumference of a circle of radius r.

The circumference varies ~~jointly~~ directly to ~~π and~~ the radius of the circle, r and a constant of variation of 2π.

Write each formula as an English phrase.

Ex2:

$r=\frac{d}{t}$, where r is the average speed when traveling d miles in t hours.

r varies inversely with time (t) with a const of Var. of d.

Write each formula as an English phrase.

Ex:3

$s=kx^3$, where s is the strength of a muscle that has length x.

Solve each variation problem:

Ex1:

If m varies directly as x and y, and m = 10 when x = 4 and y = 7, find m when x = 11 and y = 8

$m = kxy$

$10 = k(4)(7)$

$10 = 28k$

$k = \frac{10}{28} = \frac{5}{14}$

$m = kxy$

$m = \frac{5}{14}xy$

$m = \frac{5}{14}(11)(8)$

$m = \frac{220}{7}$

Ex2:

What happens to y if y varies inversely as x, and x is doubled?

$$y = \frac{k}{x}$$

$$y = \frac{k}{2x}$$

y gets cut in ½

Ex3:

What happens to A if A varies jointly with b and h if b is quartered and h is doubled?

$$A = kbh$$

$$= k \cdot \frac{b}{4} \cdot 2h$$

$$= \frac{1}{2} kbh$$

divided by

halved

Lets apply what we have learned.

The pressure of a compressed gas is inversely proportional to its volume according to Boyle's Law. A pressure of 40 pounds per square inch is created by 600 cubic inches of a certain gas. Find the pressure when the gas is compressed to 200 cubic inches.

let p = pressure of comp gas in pounds/in^2

V = volume

$$p = \frac{k}{V}$$

$$40 = \frac{k}{600}$$

$$k = 24000$$

$p = 24000$

$$p = \frac{24000}{200}$$

$$p = 120$$

Hooke's law for an elastic spring states that the distance (d) a spring stretches varies directly as the force (f) applied. A force of 30 pounds stretches a certain spring 5 inches. Find how far the spring is stretched by a 50 pound weight.

$d = Kf$

$5 = K \cdot 30$

$\frac{1}{6} = K$

$d = \frac{1}{6}f$

$d = \frac{1}{6}(50)$

$d = \frac{25}{3} = 8\frac{1}{3}$ in

HW pg 334-336 2-6, 12-40 even 43,44 all + WKST